# RESPONSES TO
# U.S. ENVIRONMENTAL PROTECTION AGENCY
# AND
# COLORADO DEPARTMENT OF HEALTH
# COMMENTS

## FINAL DRAFT PAST REMEDY REPORT
## CONTAMINATION OF THE LAND'S SURFACE
## OPERABLE UNIT NO. 3, IHSS 199

U.S. DEPARTMENT OF ENERGY

ROCKY FLATS PLANT

GOLDEN, COLORADO

APRIL, 1991

# EPA COMMENT RESPONSES
# FINAL PAST REMEDY REPORT - OPERABLE UNIT NO. 3, IHSS 199

NOTE: The following are responses to EPA comments received by DOE on January 31, 1991 regarding the October 24, 1990 draft final of the IHSS 199 Past Remedy Report. These comments were grouped into General Comments and Specific Comments. The specific EPA comments reference pages and/or sections of the draft final report, but are not numbered. The numbering system in the left-hand column of the following responses are based upon ordered numbering of the comments.

GENERAL COMMENTS

EPA-G1 "A complete site conceptual model must be developed which shows consideration of the source of contamination in the settlement lands, the appropriate release mechanisms, the appropriate transport and receiving media, and all potential exposure pathways."

Response: The scope of the final Past Remedy Report has been expanded to include consideration of all potential Rocky Flats Plant (RFP) contamination sources to off-site soils, and to include land surfaces other than the IHSS 199 remedy acreage. This broadened definition of IHSS 199 is developed in Sections 1.0 and 2.0 of the final Past Remedy Report. However, because very few site-specific data are available regarding potential RFP-derived contamination in IHSS 199 soils outside of the remedy acreage, and because plutonium is the only known RFP-derived contaminant at the remedy acreage based upon past studies, the Conceptual Model of Contaminant Fate and Mobility (Section 3.0) and the Preliminary Human Health Risk Assessment (Section 4.0) focus on plutonium at the IHSS 199 remedy acreage. Other prospective RFP-derived contaminants and other areas of IHSS 199 will be characterized during future RCRA Facility Investigation/Remedial Investigation (RFI/RI) activities at the site.

EPA-G2 "At many points in the document, statements and assumptions are made with no reference or justification presented in the test. This results in a document which lacks credibility. The final Past Remedy Report should be edited carefully to ensure that the rationale for important assumptions is presented and appropriate references cited."

Response: Efforts have been taken to more carefully develop statements, assumptions, and conclusions in the final Past Remedy Report, and to reference these as appropriate.

EPA-G3 "The conclusion that the available data are not of sufficient quality to be used in a quantitative risk assessment is the basis for all the statements regarding risk that are made in the document yet is unjustified by the information presented. For this reason, it is imperative that a complete evaluation of the available data be included in the final Past Remedy Report. This evaluation should follow the criteria contained in the EPA publication "Guidance for Data Useability in Risk Assessment". Only after such an evaluation can conclusions be drawn about the quality of the data."

Response: Appendix A of the final Past Remedy Report, "Draft Evaluation of Data Useability for IHSS 199," evaluates existing IHSS 199 data against the criteria set forth in EPA's "Guidance for Data Useability in Risk Assessment." The EPA guidance was published in October 1990, after the draft final of the Past Remedy Report was prepared. It should be noted that, although the conclusions regarding existing IHSS 199 data useability for risk assessment remain unchanged, these data were collected for purposes of site characterization rather than risk assessment. The final Past Remedy Report attempts to place the existing data in proper historical perspective, such that their usefulness, value, and "quality" do not appear to be in question.

EPA-G4 "Regardless of the data useability for quantitative risk assessment, the final document must include some type of quantitative indicator of relative risk of the contamination in the settlement lands before, during, and after the remedy. EPA suggests an evaluation of soil contamination of 1, 10, and 100 pCi/gm using the methodology contained in section C of the Health Effects Assessment Summary Tables."

Response: The final Past Remedy Report provides a more thorough treatment of the relative risk posed by IHSS 199 remedy acreage contamination before, during, and after the court-ordered remedy. Per EPA suggestion, a "generic" risk assessment is included (Appendix C) which calculates human health risk associated with hypothetical plutonium in soil concentrations (1, 10, and 100 pCi/g) under both recreational and residential land use scenarios at IHSS 199.

SPECIFIC COMMENTS

EPA-1 "Page F-1, paragraph 2: The draft Interagency Agreement (IAG) does not incorporate the terms of the Settlement Agreement of July 1985."

Response: The foreword has been dropped from the final Past Remedy Report. Information previously contained therein has been incorporated into the Executive Summary and Introduction of the final Past Remedy Report.

EPA-2 "Page F-1, paragraph 4: Although the Department of Energy (DOE) makes the statement in the Past Remedy Report that the available data are not of sufficient quality to support a rigorous quantification of human health risks, there is no documentation to support this. The final report must include as an appendix, the studies which are referenced in the test along with a detailed evaluation of the data using criteria contained in the EPA publication "Guidance for Data Useability in Risk Assessment" (EPA/540/G-90/008)."

Response: See previous response.

EPA-3 "Page ES-2, paragraph 4: Include the existing data which indicates "...that there has not been any measurable exposure to human receptors downwind of SWMU 199...". In general, qualitative statements such as "measurable exposure" must be supported with the data and a discussion so that the reader can follow the logic on which such claims are based."

Response: RFP air monitoring data upon which the statement in question is based are discussed in much greater detail in the final Past Remedy Report (see Section 2.1.3). Selected air monitoring data are included in Appendix D, "IHSS 199 Data Sources." Results of routine on-site and off-site RFP air monitoring are summarized in monthly and annual RFP environmental monitoring reports.

EPA-4 "Page ES-2, paragraph 2: Include a reference for the statement that the great majority of soil plutonium concentration originated as windborne particulates from the 903 pad. The fires which occurred at the Rocky Flats Plant in 1957 and 1969 resulted in releases of contaminants which

conceivably could have been transported to off site media. The discussion of site history should include this information."

Response: Other prospective RFP contaminant sources are identified in the final Past Remedy Report, including the 1957 and 1969 fires referenced in the comment. Krey and Hardy (Appendix D, Document D-1) concluded in their 1970 study of off-site soil plutonium contamination that the great majority of the plutonium originated from the 903 Pad. As noted in the final Past Remedy Report, this conclusion has remained unchanged in light of subsequent studies, and has been supported by on-site investigation of the 903 Pad and surrounding areas (Operable Unit No. 2).

Please note that the Executive Summary does not contain references. Information contained in the Executive Summary is referenced as appropriate where it appears in the main text.

EPA-5 "Page 1, Paragraph 2: Site number 199 is not limited to the areas which were the subject of the 1975 lawsuit but includes all lands containing contamination from the Rocky Flats Plant."

Response: The description of IHSS 199 in the final Past Remedy Report has been broadened to include all off-site soils contaminated as a result of RFP releases.

EPA-6 "Page 1, Paragraph 2: The 1975 lawsuit referred to in this paragraph was actually the landowners against the United States, not DOE. This is referred to correctly in other parts of the document but needs to be corrected in this instance."

Response: This has been corrected in the final Past Remedy Report.

EPA-7 "Page 1, Paragraph 3: Site 198 has been deleted from the draft IAG. The last two sentences in this paragraph should be deleted to reflect this."

Response: The two sentences referring to IHSS 198 have been removed from the final Past Remedy Report.

EPA-8 "Page 2, Section 1.1: The specific objective listed in this section as "Provide a preliminary qualitative health risk assessment..." is not consistent with the requirements of the IAG. Table 5 of the Statement of Work (SOW) requires that DOE include a health risk assessment in this report. Section VII.D of the SOW details the components of a health risk assessment. A "preliminary, qualitative" assessment does not fulfill the requirements of Section VII.D. of the SOW. The objective should be to provide a quantitative health risk assessment. Although it is recognized that this objective could not be met due to problems with the quality of the available data, the intended objective must be consistent with the terms of the IAG. As this section is currently written, it appears predecisional and biased against quantitative assessment."

Response: The discussion of IAG requirements for the Past Remedy Report has been expanded in Section 1.1 of the final Past Remedy Report. The IAG requirements from Table 5 of the IAG SOW are included verbatim, and risk assessment components set forth in Section VII.D of the SOW are incorporated by reference and discussed. The specific objective identified in the comment has been changed from

"Provide a preliminary qualitative health risk assessment..." to "Provide a preliminary health risk assessment..."

EPA-9 "Page 3, paragraph 1: The draft IAG does not require consistency with the National Environmental Policy Act (NEPA). Like the NEPA regulations, the remedial investigation/feasibility study and remedy selection processes under CERCLA provide for consideration of the potential impacts of CERCLA response actions on the environment and for significant public participation. CERCLA response actions are not required to follow procedures in addition to those in the NCP in order to comply with NEPA."

Response: This has been corrected in the final Past Remedy Report.

EPA-10 "Page 3, paragraph 2: Provide a reference for the EPA screening level of 20 pCi/g. Presumably, DOE is referring to material contained in EPA publication 520/1-90-016, Transuranium Elements, Volume 2. It is important that the reader understand the assumptions and methodology used to determine the EPA screening level and the EPA action level.

The Colorado Department of Health (CDH) soil guideline/standard of 0.9 pCi of plutonium per gram of soil is more restrictive than the EPA screening level guidance of 0.2 x $10^6$ pCi of transuranic radionuclides per square meter of soil surface area for samples collected at the surface to a depth of 1 cm and for particle sizes under 2 mm. However, the difference is not as large as that stated in the report. Depending on the assumed specific gravity of the soil, the EPA screening level guidance corresponds to a calculated total transuranic concentration in the range of 8 to 20 pCi/gram of soil. Other differences between the CDH and EPA guidelines are the depths of the sample layers (the CDH guideline considers the top 1/8" of soil while the EPA guideline considers 1 cm) and soil particle size. Any comparison of the two guidelines must contain this information."

Response: The explanation of the EPA screening level guidance provided in this comment, and detailed in the EPA's "Transuranium Elements," has been incorporated into Section 1.2 of the final Past Remedy Report. Two references have also been provided (EPA, 1990 and U.S. District Court, 1985b) which discuss the technical aspects of the CDH special construction standard and the EPA screening level guidance.

EPA-11 "Page 4, Section 2.1, Location and Physical Description: The last sentence in this section indicates that public access to lands within OU-3 is restricted. This seems to be inconsistent with the description on page 12, section 2.2.1 which states that 250 acres were dedicated to the Jefferson County Open Space program. What kinds of land use restrictions, if any, are associated with the Open Space Program? Please clarify as this has impact on the types of populations exposed before, during, and after the remedy was implemented and also the types of activities those populations are likely to be engaged in. Recognize also that an assessment of the risks after the remedy has been implemented must include consideration of future land use. Paragraph 6.2.2 of the Risk Assessment Guidance for Superfund, Volume I contains guidance on the consideration of future land uses. Specifically this guidance recommends that a risk assessment assume future residential land use if it seems possible based on the evaluation of the available information in various land use planning documents for the area. EPA believes this land use scenario is possible."

Response: The current use of Jefferson County remedy acreage is clarified in Sections 1.2 and 2.2.1 of the final Past Remedy Report. Future residential land use at the site is considered under the Preliminary Human Health Risk Assessment (Section 4.0) and the Generic Rick Assessment for IHSS 199 (Appendix C).

EPA-12 "Page 4, Section 2.1.1, Historical Contamination from the RFP: This section should include some mention of other sources of off site soil contamination such as accidental releases."

Response: Section 2.1 has been expanded in the final Past Remedy Report in response to this comment and several others. Other prospective RFP sources of off-site soil contamination are addressed in this section.

EPA-13 "Page 4, Last Paragraph: Background concentrations of plutonium and americium are referred to here and in a number of other places in the Past Remedy Report, but are not defined. A definition of background should be included (particularly since these radionuclides are not naturally occurring at this site). A table of background concentrations should be provided for comparison with the site historical data. A reference and a description of the background data collection location should also be provided. Background levels of uranium should be considered also.

A quantitative basis for evaluating site contamination is needed. The background concentrations referred to are anthropogenic rather than naturally-occurring; therefore, a specific definition of the term as it is used here will avoid the unintended misinterpretation that plutonium and americium are naturally-occurring compounds at SWMU 199 (see EPA, 1989, Section 5.7.1)."

Response: Section 2.1 has been expanded in the final Past Remedy Report in response to this comment and several others. Included is discussion of previous efforts and ongoing work to define background concentrations in soil of potential RFP contaminants, including plutonium, americium, and uranium. The text includes clarification of the anthropogenic origin of plutonium at IHSS 199.

EPA-14 "Page 8, Section 2.1.2.2, Surface Water: Walnut Creek does not discharge into Standley Lake, Woman Creek discharges into Standley Lake."

Response: This typographical error has been corrected in the final Past Remedy Report.

EPA-15 "Page 9, Section 2.1.2.3, Groundwater: The large discrepancy between the estimates of horizontal flow velocity for the Rocky Flats Alluvium needs to be addressed. What is the uncertainty associated with each estimate? What are the plans for additional investigations for determining the horizonal velocity? Future investigations can be mentioned in section 4.14, Data Needs."

Response: The discussion of large variations in measured hydraulic conductivity in the Rocky Flats Alluvium and other Rocky Flats aquifers is beyond the scope of the Past Remedy Report. In the final Past Remedy Report, three studies are referenced which address this topic in detail. Characterization of IHSS 199 hydrogeology is recognized as an additional data need which will be considered under future RFI/RI activities at the site.

EPA-16 "Page 11, Section 2.1.2.5, Biota: The section on biota is inadequate. Biota needs to be addressed in terms of the adverse effects on the ecosystem as a result of soil contamination and not merely "as it pertains to contaminant fate and transport and to remedial activities". Please refer to the Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual (EPA 540-1-89-001). The draft past Remedy Report does not mention important foodwebs in the area of Operable Unit 3 (OU-3) and there is no discussion within other sections of the report on the possible effects on ecological systems of plutonium and americium concentrations in the soils. The report only mentions vegetation and one species, prairie dogs. The Environmental Evaluation Manual recommends that an environmental evaluation consider the following factors which influence the effects of contaminants on ecological systems:

1. Susceptibility of existing species
2. Characteristics governing population abundance and distribution
3. Temporal variability in communities
4. Movement of chemicals in food chains.

Provide a detailed and accurate description of the existing ecological system, and an acceptable environmental evaluation."

Response: Environmental evaluation of IHSS 199 falls outside of the scope of the Past Remedy Report (see Section 1.1). The IHSS 199 ecosystem and potential contaminant impacts to it will be addressed under future IHSS 199 RFI/RI activities. These points are clarified in Section 2.1.4.5 of the final Past Remedy Report.

EPA-17 "Pages 11 and 12, Section 2.1.2.5.: Only two of the species listed as common to the area (western wheatgrass and sideoats grama) are contained in the revegetation seed mix listed. The use of a more compatible seed mix would enhance revegetation success. Native species will be more successful in establishing a permanent vegetative cover than nonnative species and will require less manipulation of the environment."

Response: The seed mixture for revegetation of the remedy acreage was mandated in the lawsuit settlement agreement and cannot be changed without permission of the court. Note that the proposed actions for 1990 (Appendix D, Document D-15) includes proposed changes to the seed mixture.

EPA-18 "Page 13, second paragraph: What was the thickness of the top layer of soil represented by the soil sample collection procedure used during the 1977 to 1979 field investigation program? That is, was the CDH procedure employed? If not, how did the collection procedure differ from the CDH procedure?"

Response: Soil sampling methods utilized during the 1977-1979 lawsuit acreage investigation are detailed in Appendix D, Documents D-4, D-5, and D-7.

EPA-19 "Page 14, second paragraph: At a minimum, provide a reference document for the results of the soil sampling completed during 1977. A table summarizing the results would be more useful along with an appendix containing all the referenced studies."

Response: Supporting documents are included in Appendix D (Documents D-4, D-5, and D-7). Data from these documents are summarized in Table 4.2.

EPA-20 "Page 14, third paragraph: Same comment as above. The results of the 1985 soil sampling program at least need to be referenced and it would be best if the data were summarized in the body of the report and contained in an appendix."

Response: Supporting documents are included in Appendix D (Documents D-8 and D-9). Data from these documents are summarized in Table 4.2.

EPA-21 "Pages 17 through 20, Section 2.2.3.1: As required by the settlement agreement, grass seed was planted in Section 7 during the fall of 1986 but was plowed up in June and July of 1987 because the seeding effort was deemed a failure. As a result, the reseeding program was revised. This revision is not appropriate because the initial reseeding program was abandoned prematurely. The original plan should be implemented. Because these grasses typically emerge late, the abandonment schedule did not allow time for emergence and development. Sections 7 and 18 were then seeded in April, which is the wrong season for planting these grasses. The evaluation of success of the seeding effort was premature, therefore some of the proposed actions on page 19 are unnecessary. Reseeding without tilling, preferable with a change of seed mixture (to a completely native mix), are appropriate. The other actions listed are unnecessary and counterproductive (Wolfe, 1982)."

Response: The specific remedy actions taken to date at the IHSS 199 remedy acreage were proposed by the SCS and incorporated into the terms of the lawsuit Settlement Agreement, and are therefore mandated by the court. The reasonableness and appropriateness of the actions taken to date are open to debate, but the flexibility of the remedy program is limited by the settlement agreement. Proposed actions for future revegetation of the tilled areas are contained in Appendix D (note that Document D-16, the most recent annual remedy report to Jefferson County, was prepared after the draft final Past Remedy Report was completed).

EPA-22 "Page 19, third paragraph: Before the treated water from holding pond C-2 is used for irrigation of remedial acreage as suggested in this paragraph, as assessment should be done of the resulting concentrations of plutonium, americium, uranium, and other contaminants which will be transported downstream through surface runoff. How can the cities consider using pond water from C-2 which may then eventually drain into Standley Lake or Great Western Reservoir when they are currently designing a diversion canal and hold pond to "physically separate Rocky Flats Plant from the water supplies" for the cities of Broomfield and Westminster? This appears to be inconsistent and puts into question the purpose of the water diversion project."

Response: The verbiage regarding use of Pond C-2 water for remedy acreage irrigation has been removed from the final Past Remedy Report.

EPA-23 "Page 21, first paragraph: Figure 3-1 appears to be inconsistent with the language in section 3.0 of the report. It is more accurate to label the Rocky Flats Plant as the historical contamination source and surface water and air as the historical transport media. Suggested revisions to figure 3-1 were provided to DOE and EG&G at a meeting on January 10, 1991.

One important secondary transport medium which has been neglected in section 3.0 and figure 3-1 is soil. Contaminants can be transported internally by ingestion and externally by dermal contact with the soil. These two important exposure pathways need to be considered."

Response: The existing Figure 3-1 was believed to be consistent with and representative of the discussion of IHSS 199 contamination provided in Section 2.1 and the conceptual model framework provided in the introduction to Section 3.0. IHHS 199 contamination is, by definition, a result of RFP releases. Figure 3-1 provides a schematic representation of all conceivable release mechanisms, transport media, exposure routes, and potential receptors at IHSS 199, and it not limited to those which actually exist at the site. The existing Figure 3-1 shows direct contact with and ingestion of soil.

EPA-24 "Page 21, first paragraph: It would perhaps be more useful to present this information in both a diagrammatic and tabular form. First, consider all possible release mechanisms, transport media, receiving media, and exposure routes. As information is gathered about the physical/chemical properties, some of the media and exposure routes may be eliminated or information which needs to be gathered can readily be identified. However, by showing diagrammatically and in tabular form, it will be obvious that all were considered and you will be better able to justify conclusions made about risks."

Response: The conceptual model is provided in tabular form (Table 3.1) in the final Past Remedy Report.

EPA-25 "Page 22, fourth paragraph: What is the basis for the conclusion that "plutonium is the only significant contaminant at SWMU 199"? The decision to consider only plutonium in OU-3 may or may not comply with guidance contained in EPA's Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual and the NCP. The technical justification for not looking at other contaminants must be presented in this report. Where no technical justification exists, the contaminant must be considered. In particular, americium, a decay product of plutonium, needs to be considered."

Response: Because plutonium is the only contaminant which is known to exist at IHSS 199 as a result of RFP releases, it is the only contaminant considered for purposes of the final Past Remedy Report conceptual model and risk assessment. Note that concentrations of several other radionuclides, including americium, were measured during the 1977 characterization of lawsuit acreage contamination (Appendix D, Documents D-4, D-5, and D-7). Other prospective IHSS 199 contaminants will be identified in future RFI/RI activities at the site.

EPA-26 "Page 23, Section 3.1, Source Area Characteristics: The assumption is made here and throughout the report that the plutonium present in the off site soils is plutonium dioxide, but no rationale or data to support this assumption are provided nor are any references cited. Data should be provided that verify this assumption or a rationale to justify it should be presented. The form of plutonium in the environment is an important factor to be considered when evaluating transport and exposure pathways. Justification of the assumption that plutonium exists as plutonium dioxide is essential in order to validate the health risk evaluation."

Response: The final Past Remedy Report cites several references to support the assumption that the plutonium present at IHSS 199 is plutonium dioxide.

EPA-27 "Page 25, Section 3.3, Fate and Mobility in Surface Water: Colloidal transport of plutonium in ground water is briefly mentioned but is not followed by any discussion of the colloidal transportation of plutonium by surface and ground waters. Additionally, the recommendations and conclusions do not address this possibility by suggesting further study of it. Some further discussion of this phenomenon is required, if only to dismiss it as a reasonable possibility based on site conditions, data, or other rationale. Colloidal transport of plutonium and americium far beyond distances previously expected has been shown to occur (Penrose, 1990). It is important to explain how colloidal transport is related to SWMU 199 site contamination. This explanation should demonstrate that all potential transport pathways have been evaluated. Colloidal transport is recognized in other DOE documents as a potential transport mechanism. It is discussed in the Surface Water Interim Remedial Action Plan."

Response: The possibility of colloidal plutonium transport in ground water will be addressed during future IHSS 199 RFI/RI activities. The final Past Remedy Report clarifies this point, and contains a more thorough discussion of the Penrose et al. study and its possible implications for IHSS 199 plutonium migration.

EPA-28 "Page 26, Section 3.4.: This section should include a statement that the fate, transport, and qualitative health risk associated with plutonium in surface water and reservoir sediments have been evaluated and discussed (DOE, 1990b). Such a statement will provide assurance with surface water run-off from SWMU 199 are being fully evaluated. Without such a statement, the discussion of the plutonium fate in the reservoirs appears overly simplistic and out of place."

Response: The DOE document identified in the comment is referenced in the final Past Remedy Report.

EPA-29 "Page 27, Section 4.0, Qualitative Human Health Risk Assessment: This section should restate that a quantitative risk assessment will be performed in accordance with the EPA guidance (EPA, 1989) as part of the remedial investigation. This statement is important because the evaluation conducted is inadequate with respect to EPA guidance. It would also assure that this document serves only as a preliminary assessment for directing further studies."

Response: The recommended statement has been included in this section (Page 39, second paragraph).

EPA-30 "Page 27, first paragraph: The objectives of this report as stated in this paragraph completely ignore the environmental component of the risk assessment. Protectiveness to both human health and the environment must be assessed as part of the risk assessment process."

Response: Environmental evaluation of IHSS 199 falls outside of the scope of the Past Remedy Report (See Section 1.1).

EPA-31 "Page 27, second paragraph: What is the basis for the conclusion that "the quantity and quality of existing data for SWMU 199 are insufficient to perform a rigorous quantitative human health risk assessment for the site"? In order to determine the validity of this statement, the data must be presented and analyzed. An assessment for the site"? In order to determine the validity of this statement, the data must be presented and analyzed (sic). A qualitative assessment without adequate justification is unacceptable in that it does not comply with the requirements of the IAG, the NCP, or EPA guidance on conducting risk assessments for Superfund sites. This section should include a

tabular presentation that demonstrates the historical data's inadequacy for a quantitative assessment. For example, the table should list the various studies and show the differing or unknown analytical methods, the differing or questionable detection limits, the differing analytical laboratories, and the lack of quality assurance procedures where it is relevant. Criteria for such an evaluation is contained in the EPA publication "Guidance for Data Useability in Risk Assessment" (EPA/540/G-90/008). Such a systematic tabulation of the data's inadequacies will provide the basis for the justification of a qualitative as opposed to quantitative assessment.

Response: An evaluation of the data useability is provided in Appendix A. The results indicate that the existing data are insufficient to perform a quantitative risk assessment.

EPA-32 "Page 27, third paragraph: Define the term "contaminant of concern". Is this a subset of all the contaminants thought to be present at the site? What is the basis for not looking at all contaminants? This paragraph seems to be contradictory. The statement is made that plutonium is the "only contaminant of concern" however, an additional statement that "media specific analyses of other radionuclides present at the RFP, such as americium-241, have not be performed..." How can a determination be made that plutonium is the only contaminant of concern when no others have been considered? Are there any non-radioactive contaminants of concern?"

Response: The text has been changed to reflect the more accurate statement that $^{239}$Pu has been the only contaminant that has been characterized. Additional radionuclides and chemicals will be addressed during the RFI/RFI/RI.

EPA-33 "Page 28, first paragraph: If available information indicates that the added risk due to the presence of americium is more than one order of magnitude as stated in this paragraph, then americium must be considered. If the statement in this paragraph is in error, then it should be corrected; otherwise, the conclusions are in error."

Response: The statement has been removed from the text.

EPA-34 "Page 30, Section 4.2, ARARs: This section on ARARs should be introduced with some statements explaining how ARARs are considered along with information from a risk assessment in establishing remediation goals during the feasibility study process. Refer to section 300.430(e) of the NCP for guidance on the establishment of remediation goals. Without such an introduction, this section on ARARs appears extraneous to the remainder of the draft Past Remedy Report and the relationship between ARARs and acceptable exposure levels determined in the risk assessment process is not clear. Another alternative is to delete this section from the report entirely as the objective of the report is merely to provide a risk assessment. If the section is retained, the ARARs should be organized in a table to which references can be made as needed. This will help to address the document's organizational problems."

Response: This section has been deleted from the text.

EPA-35 "Page 30, Section 4.2, ARARs: The air monitoring data mentioned briefly in this section should be summarized in a table (average plus or minus one standard deviation, maximum, and minimum for

some representative time period) and moved to the section on historical data. There should also be a discussion of how well the data represent a reasonable estimate of air emissions from SWMU 199. These data are mentioned but not used in the evaluation, consequently, the reason the data are not used and the way they compare quantitatively with the standards should be mentioned. Because the air pathway is considered of primary importance, a more complete discussion of these data is important to the evaluation. Also, the reason these data are not useful for a quantitative assessment is not clear. This is very important for directing the remedial investigation because direct measurements of the air emissions from SWMU 199 are very useful when evaluating the site's risk."

Response: Air sampling data have been added to Section 4.5.2.1 as the ARAR section has been deleted.

EPA-36 "Pages 30-31: The toxicity assessment is completely inadequate. There is no mention of the basic indicators of toxicity such as the weight of evidence, the cancer potency slope factors, reference doses, or discussions on what studies these factors are based on. This information is available in the Health Effects Assessment Summary Tables published quarterly by EPA and should be included in the toxicity assessment. Also, Section 7.7 on page 7-20 of the Risk Assessment Guidance for Superfund, Volume I, contains explicit guidance on summarization and presentation of toxicity information in a risk assessment."

Response: A more detailed toxicity assessment has been included in Section 4.3.

EPA-37 "Page 31: The statement on page 31 that the levels of plutonium in soils are "very low" is qualitative and has no basis without quantitative comparisons (i.e., low compared to what?). As the text is written, there is no information presented which allows for such a conclusion."

Response: A range and average of $^{239}Pu$ activity levels in soil has been included in Table 4.2. The qualitative statement of "very low levels" of Pu has been deleted.

EPA-38 "Page 31, Last Paragraph: The statement that "the low levels of internal exposure that workers and the public could potentially receive from SWMU 199...can cause genetic and somatic...effects..." is unsupported by a reference or an explanation. Also, the "low levels" referred to are undefined because no doses are calculated. This discussion should be rewritten with evidence and references included."

Response: The statement has been deleted.

EPA-39 "Page 32, last paragraph: The identification of exposure pathways is impossible with an assessment of the exposed population. The exposed population must be identified and characterized in terms of the predominant population and the sensitive subpopulations. Land use scenarios must be fully developed. Section 4.12 should be moved to precede the discussion of exposure pathways. Identification of the characteristics of the exposed population is the first step in any exposure assessment. Refer to the Risk Assessment Guidance for Superfund, Section 6.1.1 for additional guidance."

Response: Based on current land use and the lack of site-specific data it is felt that it is beyond the scope of this preliminary assessment to define the extent of the exposed population. Instead a generic assessment

has been developed that calculates worst-case risk based on residential home construction directly on IHSS 199. Section 2.2.1 addresses available information on IHSS 199 demographics.

EPA-40 "Page 32, last paragraph: Other site characteristics that need to be considered include meteorology and location and description of surface water."

Response: The recommended change has been made to the text.

EPA-41 "Page 33, second paragraph, section 4.5.1: Bioaccumulation needs to be considered in an environmental evaluation as a potential secondary release mechanism."

Response: Bioaccumulation has been considered in the generic risk assessment. It has been calculated to contribute a negligible increase in risk. Bioaccumulation will be addressed under future RFI/RI activities at IHSS 199.

EPA-42 "Page 33, section 4.5.2, Identification of Transport Media: The basis for the conclusion that the only primary transport media for plutonium is surface soils must be provided. Were any other transport media investigated or is this conclusion based on an incomplete investigation of all possible transport media? Also in this section, it appears that the terms transport media and release mechanism are being misused. For example, groundwater is correctly referred to as a transport media but surface runoff and biotic uptake which are release mechanisms are incorrectly referred to as transport media also. The transport media for these mechanisms are surface water and biota respectively."

Response: Inhalation from the soil transport media remains the only primary transport media for the current land use scenario. Future land use does consider the ingestion pathway. Surface water has been reidentified as a transport media in the text.

EPA-43 "Page 36, second paragraph: The basis for the statement that the potential impact of re-entrained soil particles on human receptors appears low seems to be the results of air sampling. This data must be presented and discussed in this report in order to justify qualitative statements such as this."

Response: Air sampling data have been included in Section 4.5.2.1 and Appendix D to support the qualitative statements.

EPA-44 "Page 36, section 4.5.2.2, Plutonium uptake in the Food Chain: This section references section 3.1.3. There is no section 3.1.3. Provide a reference which supports the conclusion that plutonium is not considered to be ecologically mobile."

Response: References have been included.

EPA-45 "Page 36, Section 4.5.2.2, second paragraph: Provide a reference for and the value of Log $K_{ow}$ for plutonium and discuss what this value indicates in terms of potential for bioaccumulation. What is a "low" value for this parameter? Such qualitative statements must be supported by quantitative values."

Response: Log $K_{ow}$ has been deleted from the document.

EPA-46 "Page 36, Section 4.5.2.2: The statements made in the first three paragraphs regarding the low solubility and low mobility of plutonium in the physical and biological environment should be referenced. These statements are central to the analysis of potential transport and exposure pathways and, therefore, require justification by reference to published scientific data."

Response: References have been provided and Section 3.0 expanded to address solubility and mobility.

EPA-47 "Page 36, Section 4.5.2.2, Last Paragraph: The first two sentences, which are a generic description of aquatic nutrient cycling, appear unrelated to the last statement regarding the $K_{ow}$ of plutonium and uptake of plutonium by terrestrial plants. The information on aquatic nutrient cycling appears irrelevant to the discussion and the site. The purpose of this discussion should be clarified or eliminated. The statement regarding the low $K_{ow}$ of plutonium should be moved to the paragraph where this parameter and its relationship to food chain transfer are discussed."

Response: Log $K_{ow}$ has been deleted.

EPA-48 "Pages 37 and 38, Section 4.5.2.2: The paragraphs concerning foliar deposition of radionuclides appear unnecessary and should be eliminated. There is no discussion of relationship between the factors presented and conditions at SWMU 199. Section 4.5.3.4 dismisses biotic uptake as a concern without any mention of foliar deposition and makes the unreferenced statement that "...indicator plants and animals have been identified, sampled, and found to contain normal background ranges of plutonium...." Consequently, it is not clear what the discussion of foliar deposition is meant to contribute to the analysis.

The statement regarding the results of sampling and analysis of plants should be expanded and referenced (and a brief, tabulated summary of these results included in the historical data section). It would be more appropriate to add to Section 4.5.3.4 a short paragraph stating that foliar deposition can occur and may lead to contaminant transfer up the food chain but that data indicate this is not occurring.

When background information is presented, it should be linked to site conditions and processes. If data indicate a particular pathway is unimportant, then the data should be discussed and referenced to justify elimination of that pathway. Evidence that the pathway was considered and justifiably eliminated is necessary."

Response: References have been added and information included that should address these comments.

EPA-49 "Page 38, Section 4.5.2.3: This section should be rewritten so that it agrees with Section 3.4 which indicates that some migration of plutonium from SWMU 199 to the adjacent reservoirs may be occurring as a result of erosion processes."

Response: A statement to address this comment has been added to Section 4.5.2.3.

EPA-50 "Page 39, Section 4.5.3, Potential Pathways at SWMU 199: Figure 4.1 ignores the soil ingestion pathway. This pathway may be significant and should be considered."

Response: The soil ingestion pathway has been added for the future use scenario (see Figure 4-2).

EPA-51 "Page 39, second paragraph: Based on the discussions contained in previous sections of the report, an additional probability ranking of "not enough data available to make a determination" appears to be necessary. Since the discussion on transport media recognizes that plutonium can be deposited on plants and subsequently be available for ingestion by humans or animals, that surface runoff can cause plutonium to migrate, and that groundwater quality data are required to conclusively determine that SWMU 199 is not impacting groundwater, these three media should be ranked accordingly. The data required to make an assessment of these three media should then be identified in section 4.14, Data Needs."

Response: The comments have been incorporated within various sections of the document.

EPA-52 "Page 40, last paragraph: All ingestion pathways are discounted relative to inhalation purely on the basis of low GI absorption. This is a serious error. In many instances encountered in Region VIII, intake via ingestion has exceeded intake via inhalation by up to several orders of magnitude. In fact, it appears from recent monitoring data at the Rocky Flats Plant that ingestion vs inhalation intake ratios may be on the order of 10,000:1 to 100,000:1, using standard exposure assumptions and assuming that all airborne activity is associated with respirable particles. Once particle size/radioactivity associations are known, these ratios may go even higher. Certainly, this difference in intake rates could potentially offset the difference in absorbed doses estimated between ingestion and inhalation exposures. Without quantitative data on relative intake, it is not possible to estimate relative risks due to these exposure routes, even on a qualitative basis. It is certainly possible that ingestion of contaminated soil could pose a significant risk relative to dust inhalation in the off site areas."

Response: The soil ingestion pathway has been added for the future use scenario (see Figure 4.2).

EPA-53 "Page 41, Section 4.5.3.2, Surface Runoff Media: The text in this section is irrelevant to the pathways shown at the end of the section and should be completely removed. The discussion need only point out that plutonium may migrate in surface water to nearby reservoirs as stated previously and the various pathways that may result are evaluated in the assessment of SWMUs 200 through 202 (DOE, 1990b). The discussion of airborne plutonium dusts is inappropriate in a section on surface water pathways."

Response: The author disagrees with this statement. The only credible release mechanism involving surface water is transport and redeposition of plutonium by runoff in an area prone to drying and, upon drying, of plutonium reentrainment in air by wind.

EPA-54 "Page 44, Section 4.6.1: The discussion of plutonium's biological half life is confusing. It is unclear what the values presented in parentheses mean. This discussion should be clarified."

Response: The discussion of biological half-life has been clarified.

EPA-55 "Page 45, Section 4.6.2: Provide a reference and rational for the assumption that Class Y plutonium is the class found at SWMU 199."

Response: References have been included within the document that plutonium exists as a Class Y compound.

EPA-56 "Page 48, Section 4.7.3: Present or reference data to support the statement that the chemical form of plutonium at SWMU 199 is insoluble."

Response: References have been included within the document that plutonium exists as an insoluble compound.

EPA-57 "Page 48, Section 4.7.3: Because no dose equivalent has been calculated, it is inappropriate to state that the dose equivalent is negligible. Data should be tabulated and presented as discussed so they can be compared with the unit risks presented (with the appropriate caveats concerning data quality). Major assumptions should be justified with references and a clear rationale. If this is done, a conclusion that the risk associated with SWMU 199 contamination is most likely low to negligible would be better supported."

Response: The dose equivalent statement has been detailed. Appendix C provides a generic risk assessment.

EPA-58 "Page 52, Section 4.13: The statement that, "Toxicological data errors are probably the largest source of uncertainty..." implies that the data are incorrect and should be reworded. The author probably means that extrapolating the data to different species and doses is highly uncertain."

Response: The statement has been deleted.

EPA-59 "Page 53, Section 4.14: Nowhere in the data needs section is the need for representative air emissions data for SWMU 199 mentioned. This should be included. Inhalation of fugitive dusts from the site is considered the most important exposure pathway; therefore, direct measurement of airborne dusts and any associated plutonium and americium contamination is an obvious data need for the quantitative risk assessment.

Response: Air sampling has been included as a data need to be addressed under the DU3 RFI/RI.

References

DOE, 1990a. U.S. Department of Energy, "Final Draft: Remedy Report, Operable Unit 3 - SWMU 199," U.S. Department of Energy, Rocky Flats Plant, Environmental Restoration Program, Golden, Colorado, October 24, 1990.

DOE, 1990b. U.S. Department of Energy, "Final Draft: Historical Information Summary and Preliminary Health Risk Assessment Operable Unit 3 Sites 200, 201, & 202," U.S. Department of Energy, Rocky Flats Plant, Environmental Restoration Program, Golden, Colorado, November 5, 1990.

EPA, 1989. U.S. Environmental Protection Agency, "Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A), Interim Final," U.S. Environmental Protection Agency/540/1-89/002, December 1989.

Grandt, A., 1977, Species Trials on Strip Mined Areas. In J.L. Thames (ed.), Reclamation and Use of Disturbed Land in the Southwest. University of Arizona Press, Tucson, AZ.

Penrose, W., W. Polzer, E. Essington, D. Nelson, and K. Orlandini, 1990. "Mobility of Plutonium and Americium through a Shallow Aquifer in a Semiarid Region," Envir. Sci. Technol., Vol. 24, pp. 228-234, 1990.

Wolfe, M.H. 1982, Establishment of Native Grasses in the Southern Rocky Mountains. Proceedings of the Symposium of Reclamation of Mined Lands in the Southwest, Albuquerque, NM, October 20-22, 1982.

## CDH COMMENT RESPONSES
## FINAL PAST REMEDY REPORT - OPERABLE UNIT NO. 3, IHSS 199

NOTE: The following are responses to CDH comments received by DOE on January 31, 1991 regarding the October 24, 1990 draft final of the IHSS 199 Past Remedy Report. These comments were grouped into General Comments and Specific Comments. The specific CDH comments reference sections of the draft final report, but are not numbered. The numbering system in the left-hand column of the following responses are based upon ordered numbering of the comments.

GENERAL COMMENTS

CDH-G1 "It is stated many times within this document that existing data within IHSS 199 is not sufficient to perform a quantitative health risk assessment. However, there is no data presented to support this claim. Where are the holes in the data? Why was this data insufficiency not known when the IAG was being negotiated? If it had been known, these documents could have been given a different scope or canceled altogether. The Division is concerned that, in this form, this document, including only a qualitative health risk assessment (along with the Historical Information and Preliminary Health Risk Assessment for OU 3), does not fulfill the IAG requirements. It is therefore requested that, at a minimum, a summary of the available data be presented and a tabulation of risks associated with various plutonium soil concentrations and exposures pathways be included in the document (this could be similar in form to the data presented in 10 CFR 20, Table II) (as per the EPA/DOE/EG&G meeting of 1/10/91, this could be satisfied by the 1 pCu(sic)/gm, 10 pCu/gm, and 100 pCu/gm risk evaluation). As the EPA has already indicated, DOE must begin quantifying the risks associated with plutonium inhalation and ingestion so that future remediation decisions, operations decisions, and public decisions can be guided by these risk assessments."

Response: Numerous changes have been made in the final Past Remedy Report in response to this comment and similar comments from CDH and EPA. Appendix D of the final Past Remedy Report, "IHSS 199 Data Sources," provides selected IHSS 199 reference documents containing existing analytical data for the site. Appendix C, "Generic Risk Assessment for IHSS 199," provides a calculation of human health risk associated with plutonium soil concentrations of 1, 10, and 100 pCi/g under both recreational and residential land use scenarios at IHSS 199. Appendix A, "Draft Evaluation of Data Useability for IHSS 199," evaluates existing IHSS 199 data against useability criteria set forth in EPA's "Guidance for Data Useability in Risk Assessment." The discussion of IAG requirements for the Past Remedy Report has been expanded in Section 1.2 of the final Past Remedy Report, and includes a more thorough rationale for the development of a qualitative risk assessment in the Past Remedy Report.

CDH-G2 "From the description of these documents in the IAG, the following items must be addressed:

1) Assessment of public health risk before remediation
2) Assessment of public health risk during remediation
3) Assessment of public health risk after remediation
4) Effectiveness of remedy
5) Assessment of public health risk with "no action"
6) Exposure risk during remediation
7) Exposure risk after remediation.

However, only items 4, 5 and 7 are were (sic) found in the text. Even if only a qualitative discussion can be done, all of these items must be covered at some point in the document."

Response: The final Past Remedy Report provides a more thorough treatment of each of the seven areas identified in this comment.

CDH-G3 "Many of the following comments ask for data and/or maps of data that either should have been included in this document or summarized in appendices. The title of this document is "Past Remedy Report," not "Remedy Overview," and it should completely explain what has been done so that any reader can follow both the actions taken and the underlying reasons for the actions taken at this portion of IHSS 199. (As per the meeting of 1/10/91, the Division understands that a series of appendices will be added that contain the past data.)"

Response: Appendix D of the final Past Remedy Report, "IHSS 199 Data Sources," provides selected IHSS 199 reference documents containing the data requested in this comment.

CDH-G4 "With the exception of sections 4.2 and 4.6, no distinction is made between soluble and insoluble plutonium. Was the soil sampling data that dictated which portions of IHSS 199 were remediated of sufficient quality to distinguish between the types of plutonium? Since the text states that the ARAR values for each of these plutonium types is different, will future sampling and remediation address both types? If so, both types need to be dealt with as separate entities within the scope of this document.

"Soluble" and "insoluble" are relative terms. All plutonium compounds are insoluble by certain definitions; only the relative degree of insolubility is different. In addition, the Division is concerned that the designation for Class Y and W plutonium is being used incorrectly in the text of this document. All references reviewed by the division do not refer to these classes as relating to solubility, but to biological elimination rates. This is a related, but not identical, use of the class distinction. Because of this, the discussion of the biological half-lives relating to solubility needs additional clarification. Different biological half-lives and residence times within the body will give rise to different risks. Hence, the risk assessment must take that into consideration."

Response: Section 3.0, "Conceptual Model of Contaminant Fate and Mobility," has been expanded in the final Past Remedy Report to include a more complete discussion of the form of plutonium present at IHSS 199. Existing IHSS 199 data are not of sufficient specificity to distinguish between types of plutonium, but numerous studies of plutonium in the environment are referenced to support the assumption that the plutonium present at IHSS 199 is plutonium dioxide.

The authors disagree that the designations of Class Y and Class W plutonium are being used incorrectly in Section 4.0, "Preliminary Human Health Risk Assessment." Although plutonium "solubility" refers only to relative degrees of insolubility, Class Y and Class W can be used as relative indicators of environmental mobility and biological uptake.

CDH-G5 "The Colorado Department of Health, through the Rocky Flats Program Unit, is managing a toxicological review and dose reconstruction for the off-site areas around the Rocky Flats Plant. This study is part of the Agreement in Principle and is funded by DOE. Most of the work is being done by Chem-Risk, Inc., a contractor to CDH. For preparation of the final version of this document, please incorporate the study to the greatest extent possible. While still in it's infancy, this dose reconstruction will play a large part in the formulation of a health risk assessment, and cross-reference to that report within this document is a must."

Response: As stated in this comment, the CDH toxicological review and dose reconstruction study for off-site areas around the Rocky Flats Plant (RFP), being performed by Chem-Risk, Inc., is still in its infancy. At present, efforts are focused on limiting the list of potential RFP-derived contaminants to be considered under the study. It is acknowledged that the Chem-Risk study eventually will provide valuable information for the formulation of health risk assessments for off-site areas; however, the information generated to date by this study is not in a form which is applicable to the Past Remedy Report. Future RERA Facility Investigation/Remedial Investigation (RFI/RI) activities at IHSS 199 will be closely coordinated with the Chem-Risk study in order to maintain consistency and avoid redundancy between the two efforts.

CDH-G6 "In many places within this document, it is stated that plutonium is the only contaminant of concern. That is not the case. Just because plutonium is the only contaminant sampled and tested for in the past does not mean it is alone. Please make this clear in all portions of the document."

Response: It is clarified in the final Past Remedy Report that plutonium is the only RFP-derived contaminant which has been extensively characterized at IHSS 199, but that it is not the only potential contaminant of concern.

CDH-G7 "There is a general tone in this document that casts the Colorado Department of Health in a bad light. Our historical data for air, water, and soils is presented as worthless because it will not pass today's QA/QC standards. Our plutonium in-soil standard is given no respect, let alone being incorrectly referenced. Please make an effort to be objective and consistent in referring to the regulatory agencies in the future."

Response: It was certainly not the intent of the Past Remedy Report to cast the CDH, past investigators, or any other parties in a negative light. It is clarified in the final Past Remedy Report that existing IHSS 199 data were collected for purposes of site characterization rather than risk assessment. The report attempts to place the existing data in proper historical perspective, such that their usefulness, value, and "quality" do not appear to be in question. The plutonium-in-soil standard is also properly referenced as a standard rather than a guideline in the final Past Remedy Report. It is noted in Section 1.2, per the lawsuit Settlement Agreement, that adoption of the CDH standard by the court did not imply concurrence between the lawsuit parties on the reasonableness, appropriateness, or applicability of the standard as an action level for the remedy.

SPECIFIC COMMENTS

CDH-1 "Executive Summary: IHSS 199 is incorrectly defined in the text as "approximately 350 acres of land which were the subject of a 1975 lawsuit..." IHSS 199 is defined in the IAG as "contamination of the ground (sic) surface" and is not limited to those areas subject to the lawsuit."

Response: The definition of IHSS 199 in the final Past Remedy Report has been broadened to include all off-site soils contaminated as a result of RFP releases.

CDH-2 "Executive Summary, Page ES-2: Even though the 903 pad has been covered and has been removed as a source for contamination, it is not accurate to say or imply that there is now no source for contamination within IHSS 199. New contamination to IHSS 199 can result from any new abnormal emissions from the plant as well as from the already contaminated area stretching from the old 903 pad and lip area eastward to Indiana Street."

Response: Other prospective RFP contaminant sources, including the 903 Pad lip area, are discussed in Section 2.1 of the final Past Remedy Report.

CDH-3 "Executive Summary, Page ES-2: Plutonium may not be the only contaminant of concern in IHSS 199. The Division is not aware of any analysis for americium or other non-radiological hazardous contaminants for this IHSS. Before a statement to this effect can be made, please validate it with supporting studies."

Response: It is clarified in the final Past Remedy Report that plutonium is the only RFP-derived contaminant which has been extensively characterized at IHSS 199, but that it is not the only potential contaminant of concern. It should be noted that concentrations of several radionuclides, including americium, were measured during the 1977 characterization of the IHSS 199 lawsuit acreage (Appendix D, Documents D-4, D-5, and D-7).

CDH-4 "Executive Summary, Page ES-3: Please clarify the statement "appears to be very low." This is a relative statement so a comparison to some other standard is necessary. The standard used in the lawsuit was the State In-Soil Standard."

Response: The statement referenced in this comment has been removed from the final Past Remedy Report, and the conclusion in the Executive Summary from which it was drawn has been rewritten to reflect comparison with the CDH plutonium-in-soil standard used by the court as a remedy action level.

CDH-5 "Section 1.0, Introduction: The CDH Plutonium In-Soil Standard is a STANDARD, not a guideline. It is a codified regulation and has requirements if the value is exceeded. The standard should be referenced accordingly."

Response: The plutonium-in-soil standard is properly referenced as a standard rather than a guideline in the final Past Remedy Report.

CDH-6 "Section 1.0, Introduction: In the third paragraph, reference is made to IHSS 198 and that it does not require any action. Please give a description of IHSS 198 and explain why no action is necessary. This IHSS was deleted from the IAG and does not need to be addressed at all."

Response: The two sentences referring to IHSS 198 have been removed from the final Past Remedy Report.

CDH-7 "Section 1.2, Regulatory Background: The first paragraph of this section needs additional clarification. Moving the off-site areas up to OU 3 from OU 10 reflects the change in priority that, to a large degree, was mandated by public comment to the draft IAG."

Response: The first sentence of Section 1.2 has been clarified in the final Past Remedy Report in response to this comment.

CDH-8 "Section 1.2, Regulatory Background: There is, at present, no EPA screening level, contrary to the text in the third paragraph of this section (please see EPA's recent document on transuranic guidance). Again, the CDH standard is not a special construction guideline. It is a standard which provides requirements during construction. There is a difference. The standard is referenced in the Court Order."

Response: Explanation of EPA screening level guidance for plutonium in soil has been provided in Section 1.2 of the final Past Remedy Report, along with appropriate referencing of the EPA "Transuranium Elements" publication.

CDH-9 "Section 1.2, Regulatory Background: At the conclusion of this section, at least two maps need to be added. The first should be similar to Figure 2-1, but include adjacent land ownership, zoning, and both future and present land-use plans as well as the tracts and portions thereof which are being remedied. These items all play a part in the formulation of the risk associated with the "no action" alternative and it would be helpful to have them on a map. The second map should cover a larger area and should indicate plutonium concentrations in the soil wherever (and whenever) it has been measured. This map should be contoured to show the extent of the known plutonium soil contamination plume, particularly the areas that exceed the CDH guideline of 2 dpm/gm or 0.9 pCu/gm (a map similar to the one requested can be found in the document under the Krey and Hardy, 1970 reference in the bibliography in Section 6.0). It is unlikely that the lands covered by the lawsuit will be the only portions of IHSS 199 to be remedied for soil contamination within OU3. This "Remedy Report" on the efficacy of this particular remedy will help guide the choice of future restoration techniques and it would be helpful to know the extent and location of the problem areas."

Response: Section 2.1 has been expanded in the final Past Remedy Report to include discussion of past attempts to delineate the extent of off-site soil plutonium contamination around the RFP. Three figures are provided, one of which is modified after Krey and Hardy, showing plutonium in soil contours around the RFP. Several of the documents contained in Appendix D show the tracts of off-site land which are being remedied under the court-mandated settlement agreement (the "remedy acreage"). Future land use scenarios for IHSS 199 are addressed in Section 2.2.1 of the final Past Remedy Report. In the absence of detailed demographic data for IHSS 199, the final Past Remedy Report uses "worst-case" assumptions regarding potentially exposed populations (see Appendix C). Site-specific demographics will be characterized during future IHSS 199 RFI/RI activities or under other studies.

CDH-10 "Section 2.0: At several places within section 2.0, the fact that a large amount of cobbles have been brought to the surface by tilling is mentioned. The text states that in some areas, as much as 90% of the land surface is covered by these cobbles. While this may be an interesting physical characteristic of the land surface, it is unclear how or if this fact affected past remedy efforts and if it will change future remedy implementation. It is also unclear if the adjacent wheat fields have a similar problem. If they do have this problem, how has dust mitigation been addressed. If they

do not have this problem, how did they avoid it? Also, the percentage of cobble sized constituents at the surface is hard to imagine given the 0-15% rock fragment volume described for each soil type given in section 2.1.2.1. Please add text to clear up these questions and apparent contradictions."

Response: Cobbles brought to the surface during court-ordered tilling of portions of the remedy acreage have had a severe impact on attempts to revegetate these areas. The cobbles make the mechanized seeding techniques used at the site very difficult or impossible, and hinder establishment of the grasses. The soils in which the cobbles occur clearly differ in rock fragment content from soils in nearby tracts, including the formerly cultivated wheat fields, which do not have this problem. Soil descriptions provided in the draft final Past Remedy Report were specific to the IHSS 199 remedy acreage. In the final Past Remedy Report, the definition of IHSS 199 is broadened to include all off-site soils impacted by RFP releases, and the site-specific soil descriptions are replaced by a more general description of the predominant soil types in the area. The estimate of 0-15% rock fragment content given in the original descriptions are based on large-scale mapping of soil types, and could be expected to vary significantly between particular areas.

CDH-11 "Section 2.1: The text states that public access to IHSS 199 is restricted. Please define "restricted" and address all portions of IHSS 199."

Response: Current land uses and future land use scenarios around the RFP, consistent with the broadened definition of IHSS 199 in the final Past Remedy Report, are provided in Section 2.2.1. Access to the remedy acreage, which was referenced in the comment, has been clarified in Sections 1.2 and 2.2.1.

CDH-12 "Section 2.1.1: The text states that one of the significant findings from past investigations is that the only compounds in IHSS 199 with soil concentrations above background are plutonium and americium. The Division is unaware that any previous studies tested for other contaminants and could, therefore, remove them from a list of contaminants of concern. Please clarify this item and reference these studies."

Response: Section 2.1 has been expanded in the final Past Remedy Report in response to this comment and several others. Included is a discussion of the 1977 lawsuit acreage investigations (Appendix D, Documents D-4, D-5, and D-7) which characterized concentrations in soil of several radionuclides other than plutonium. The final Past Remedy Report acknowledges that other prospective contaminants of concern may exist undetected at IHSS 199. Such contaminants will be characterized under future RFI/RI activities at the site.

CDH-13 "Section 2.1.1: The information and data that is referred to in this section needs to be more adequately addressed and synthesized so that a better picture of existing contamination is generated. The reports cited neither constitute a definitive conceptual framework for the characterization of contaminants nor do they provide the strategies to be used to restore areas and control release of contaminants."

Response: Section 2.1 has been expanded in the final Past Remedy Report in response to this comment and several others.

CDH-14 "Section 2.1.1: The second bullet makes no reference to the fires at RFP that caused the release of significant amounts of radioactivity into the atmosphere. How much plutonium was released during these episodes and was it enough to impact the soil quality in SWMU (sic) 199?"

Response: The fires referenced in this comment are addressed in Section 2.1.1 of the final Past Remedy Report, along with past studies which have attempted to measure the impact of these fires on IHSS 199 soils.

CDH-15 "Section 2.1.1: The Krey and Hardy reference used in the second bullet of this section used the old plant boundary when making an estimate of off-site contamination. The values from this report need to be adjusted for the current boundaries of the plant."

Response: The estimates of off-site contamination referenced in this comment have been removed from the final Past Remedy Report. The data presented in the Krey and Hardy study are not sufficient to support such a recalculation.

CDH-16 "Section 2.1.1: Within the third bullet of this section, the text says that, in 1970, the soils "around" RFP contained 99% of the total ecosystem plutonium inventory. Please clarify "around." The addition of the map mentioned above would help address this problem."

Response: This bullet item has been rewritten to focus on the depth profile of the plutonium in soil. The document referenced in this bullet item contains information regarding the location of the study (i.e., it defines "around the RFP").

CDH-17 "Section 2.1.1: The fourth bullet states that the dominant pathway for plutonium contamination was the resuspension of dust from grass blades. This needs more explanation. How did the plutonium dust get on the grass in the first place? In this context, what is meant by "pathway"?

Common sense would argue that if the text is correct in stating that the dominant method of plutonium entrainment in the air is resuspension of dust from grass blades, then air concentrations of plutonium laden dust should have increased with an increase in vegetative cover. This is obviously not correct. Resuspension resulted from barren ground exposed to high winds. The barren ground was the result of vehicle traffic and construction. Until the 903 pad area was covered, the lip area removed and revegetated, and the buffer zone purchased and overgrazing of that area ceased, resuspension continued. In addition, vertical downward migration of the plutonium is a major reason for reduced air concentrations of contaminated dust."

Response: This bullet item has been rewritten to focus on wind and water erosion of soil, as discussed in this comment. Vertical (downward) migration of plutonium in the soil may be a reason for reduced air concentrations of contaminated dust; the depth profile of plutonium in soil around the 903 Pad is being characterized through ongoing studies of RFP Operable Unit No. 2. The depth profile of plutonium at IHSS 199 will be addressed during future RFI/RI activities at the site.

CDH-18 "Section 2.1.2.2: The last sentence in the first paragraph of this section says that Walnut Creek traverses the southern end of IHSS 199. This is incorrect and should read Woman Creek."

Response: This typographical error has been corrected in the final Past Remedy Report.

CDH-19 "Section 2.1.2.3: Reference is made in the last paragraph of this section to wells that were used for lithologic and ground water analysis. Please locate these wells on one of the maps included in the document."

Response: The wells referenced in the comment are privately owned water wells which were not drilled for purposes of site characterization. They are mentioned in the report only in the context of providing general hydrogeologic information for IHSS 199, and their specific locations are therefore not relevant to the ground water discussion presented in Section 2.1.4.3. These wells may prove more useful to ground water characterization under the IHSS 199 RI, in which case they will be located on a map of the site.

CDH-20 "Section 2.1.2.3: Because the existence of the Eggleston Fault is being questioned by the EG&G ground doing the site-wide geologic characterization, reference to it in this document may be premature."

Response: Reference to the Eggleston Fault has been removed from the final Past Remedy Report.

CDH-21 "Section 2.1.2.4: Please clarify "rainfall" versus total precipitation for this area. What percentage of yearly precipitation falls as snowfall?"

Response: The final Past Remedy Report clarifies that total precipitation for the RFP, not just rainfall, averages 15 inches/year.

CDH-22 "Section 2.2.1: The gravel pit referred to in this section does not appear on the map where it should according to the text. Which is correct?"

Response: The gravel pit is located in the northeast corner of the Broomfield remedy acreage, as shown on the site location map (Figure 2-1).

CDH-23 "Section 2.2.2: The State of Colorado was also a defendant in the lawsuit referenced in this section. Had the plaintiffs prevailed, the State would have been deemed to have not properly protected the public with the plutonium in-soil standard. If the plaintiffs had (not) prevailed, the State would have been seen as over-reactive in adopting the in-soil standard."

Response: The State of Colorado is identified as a defendant in the lawsuit in the third paragraph of Section 2.2.2.

CDH-24 "Section 2.2.2: In the second paragraph of this section, studies commissioned by the various parties to the litigation are referenced. Where is this data? Where were the sample locations? Please provide maps showing this information."

Response: Documents providing the requested information are referenced in the text and are presented in Appendix D, (Documents D-4, D-7, D-8, D-9, and D-10).

CDH-25 "Section 2.2.2: The text states that one of the conditions of the remediation was preparation of an annual report on remediation progress. Where are these reports and are they too voluminous for inclusion in the document?"

Response: The requested documents are referenced in the text and are presented in Appendix D, (Documents D-10, D-11, D-13, D-14, D-15 and D-16).

CDH-26 "Section 2.2.2: In 1985, according to the text, more soil sampling was done. Where is the data?"

Response: Documents providing the requested data are referenced in the text and are presented in Appendix D, (Documents D-9 and D-10)."

CDH-27 "Section 2.2.3.1: The text implies that the SCS recommended that the land be left undisturbed because they (the SCS) had concerns regarding radiation risk. That is not true. The SCS had concerns about soil stabilization, only."

Response: This point has been clarified in the final Past Remedy Report.

CDH-28 "Section 2.2.3.1: If possible, it would be appropriate to add within this section, or as an appendix, the approved Jefferson County Open Space lands remediation plan which contained more specifics than are addressed in the text and was based on input from the SCS, RFP, EPA, CDH, and Jefferson County personnel."

Response: The requested document is part of the U.S. District Court Settlement Agreement. Specifics of the Settlement Agreement are summarized extensively in the final Past Remedy Report.

CDH-29 "Section 2.2.3.2: The document entitled "Remedial Action Program on Jefferson County Open Space Lands in Section 7, T2S, R69W, South of Great Western Reservoir" (EAC-420-87-1) that was prepared for Rockwell International by C.T. Illsley and submitted on January 15, 1987, was given to the Division for review along with this remedy report. It contains a map showing the layout of the strips of land that were tilled. This map or a similar one should be included in this document. It visually explains a complicated situation that prose has a hard time clarifying. In the same document is a map showing the locations and plutonium concentrations of certain soil samples. Maps similar to this should be included for all of the different generations of soil sampling data for this site."

Response: The maps requested in this comment are included as Figures 2-10 and 2-11 of the final Past Remedy Report.

CDH-30 "Section 2.2.3.2: When the Jeffco land was subdivided into strips, it is unclear from the text how the subdividing and resultant tilling were done. From the map in the document referenced above, it appears that the strips that were tilled only cover half of the acreage. Was the remaining land between the strips ever sampled and was it ever tilled? If not, the text needs to make clear the fact that the remedy is only half completed after successful revegetation occurs."

Response: The final Past Remedy Report clarifies the point that the remedy actions taken to date have focused on only 110 acres of the 350-acre remedy lands. The land between the strips was sampled as part of the overall remedy acreage characterization.

CDH-31 "Section 2.2.3.2: The portions of pages 17 and 18 that explain the history of the remedy are good but could be augmented by a table (similar to Table 2.1 in the Historical Information Summary document for OU 3) that summarizes the dates, the action taken, and the portion of IHSS 199 affected. This would make this portion of the text easier to follow."

Response: Section 2.2.3.2 has been summarized in Table 2.2 of the final Past Remedy.

CDH-32 "Section 2.2.3.2: The third paragraph mentions that, after tilling, the soil plutonium concentrations were below 0.9 pCu/gm. What were the actual levels achieved? This can be addressed again in the fifth paragraph of this section."

Response: The document providing the requested data is referenced in the text and is presented in Appendix D, Document D-10.

CDH-33 "Section 2.2.3.2: In the third paragraph of this section, the text mentions sorghum as a cover crop that did not perform to the extent anticipated. When was this sorghum planted? Was it a part of the wild grass seeding or did it precede the wild grasses?"

Response: As mentioned in Section 2.2.3.1, the remedy program included planting of a cover crop (forage sorghum). The sorghum planting in question was conducted in June 1986 (as specified in the remedy program), after grass seed planted in October/November 1985 was deemed to have failed.

CDH-34 "Section 2.2.3.2: There are six specific actions listed in the text that were proposed to be completed in 1990. Were they, in fact, completed and if so, what was the result?"

Response: Section 2.2.3.2 of the final Past Remedy Report discusses the progress made by the RFP during 1990 on implementation of the remedy. Appendix D contains the latest annual remedy report provided to Jefferson County by the RFP (Document D-16).

CDH-35 "Section 2.2.3.2: Since irrigation will probably be necessary to successfully establish good ground cover on the remedied acreage, where will the responsibility rest to monitor the soil and bring in irrigation if necessary?

Irrigation could have already helped failed revegetation efforts of the last several years. Why has it not already been used?"

Response: Irrigation of the remedy acreage is no longer considered practical or necessary. The latest proposed actions for the acreage do not consider irrigation (Appendix D, Document D-16).

CDH-36 "Section 2.2.3.2: On-site sources for the irrigation water needed in OU 3 are unacceptable particularly when plenty of off-site water sources are available. pond C-2 is presently a IHSS that is being evaluated under the RFI/RI process for OU 5 (Woman Creek). Water from pond C-2 is currently diverted to the "B" series ponds where it is added to the water that goes through the NPDES treatment facility. At that point, this water is released from plant site but is still diverted around Great Western Reservoir. Use of this water for irrigation off-site would be very difficult to explain to the public and may have undesirable liabilities in the future. While the Division recognizes that plant water is not being used when it leaves plant site and irrigation may seem a good use of some of this water, until these on-site water sources are completely characterized and understood, their use as irrigation on off-site locales should not be considered."

Response: Verbiage regarding use of Pond C-2 water for remedy acreage irrigation has been removed from the final Past Remedy Report.

CDH-37 "Section 2.2.3.2: Though not required as a part of this document, some discussion on the future plans for the remedied acreage would be helpful."

Response: Future use of the remedy acreage and of IHSS 199 in general is addressed in Section 2.2.1 of the final Past Remedy Report.

CDH-38 "Section 3.0: This section is actually a "primer" or introduction for a workplan to develop a conceptual model. The lack of data (no site-specific water or solids balances, particle size distributions, analytical data on loads and concentrations, important forms or species of contaminants, aquatic communities surveys, toxicological and bio-uptake data, etc.) would not support the use of this section or conclusions drawn from it. Any model(s) will require not only an initial characterization of the site, but also follow-up activities to confirm initial and changing conditions."

Response: The conceptual model provided in Section 3.0 is a general conceptual model based on existing information for IHSS 199 and general studies of plutonium behavior in the environment. Specific data which will support a more rigid site-specific conceptual model for IHSS 199 will be developed during future RFI/RI activities at the site.

CDH-39 "Section 3.1: Are the soils and soil properties still the same after the deep tilling that was conducted in the remedy?"

Response: In the absence of site-specific data for the remedy acreage, changes to the soil properties there as a result of tilling are speculative. Potential changes are identified in Section 3.1.1 of the final Past Remedy Report.

CDH-40 "Section 3.1: Based on the morphology of the surrounding areas, recent water erosion and desiccation do not appear to be a big problem on undisturbed soil surfaces. If revegetation is successful, will erosion by surface run-off remain a large contributor to plutonium migration?"

Response: Revegetation will greatly reduce the potential contribution of surface erosion to plutonium migration from the remedy acreage. This point is made in Section 3.1.1 of the final Past Remedy Report.

CDH-41 "Section 3.1: The second paragraph of this section references particular values for data collected in 1977 and 1985. This data needs to be presented in it's (sic) entirety in this document along with maps presenting it visually.

Once again, the Division is not aware that the referenced report from Rockwell (Rockwell, 1985a) includes any analysis for contaminants other than radioactive isotopes."

Response: The referenced data is contained in documents provided in Appendix D. The discussion of contaminant characteristics (Section 3.1.2) has been clarified to avoid creating the impression that contaminants other than selected radionuclides have been characterized at IHSS 199.

CDH-42 "Section 3.2: Resuspension factors are given in the text for each of the governmental sections of land involved in the remedy. Please give some background on these figures and show how these figures were calculated.

These resuspension factors are for quiescent vegetated lands. CDH determined similar values in the 1970's. CDH also found that vehicular disturbance would change the values to 1E-8/m. EPA used this value in their draft transuranic guidance. EPA recommended that the state use 1E-7/m for the plutonium in-soil standard risk assessment (CDH, 1976)."

Response: References are cited in Section 3.2.1 of the final Past Remedy Report which detail the methodology behind development of the resuspension factors given in the text. The development of resuspension factors by CDH is also mentioned, along with the CDH reference provided in the comment.

CDH-43 "Section 3.2(3) (sic): The Division believes that the Allard et al., 1983 reference cited in this section is too generic for routine application to the RFP environs. Location-specific values would remove any questions on applicability. Information from the USGS (Cleveland) provides a very different view and was, apparently, not considered."

Response: Section 3.3 has been rewritten as Section 3.2.2 in the final Past Remedy Report. This section cites a number of references which are believed to be less generic than the Allard et al. reference in question. Location-specific values for IHSS 199 will be developed during future RFI/RI activities at the site.

CDH-44 "Section 3.2: The text indicates that the percentage of respirable plutonium particles with diameters less than 10 micrometers is 20 to 40%. Why is this true? If one 10um particle is respirable, are not all 10um particles respirable?"

Response: This discussion has been clarified in Section 3.2.1 of the final Past Remedy Report.

CDH-45 "Section 3.4: The figures given in this section for erosion by surface water make it imperative to rapidly revegetate. Referring back to the figures given in section 2.1.2.1, there is no difference between the estimated soil loss due to water and wind erosion versus water erosion alone. How does this fact impact the risk analysis in terms of the primary pathways? What plans are being made to make revegetation more rapid and successful? Also, how do the figures presented here relate to the comment above that undisturbed soils seem to be very stable based on the morphology plant and surrounding areas?"

Response: The statement in question has been corrected in Section 3.2.3 of the final Past Remedy Report to clarify that soil loss estimated by the SCS is for combined wind and water erosion. The importance of revegetation for stabilizing the soils at the remedy acreage is recognized; proposed actions to facilitate this revegetation are included in Document D-16 of Appendix D. It is also acknowledged that undisturbed soils in the vicinity of the remedy acreage appear to be quite stable, and not prone to the erosion that the SCS estimates for bare soil. The appropriateness of court-ordered tilling at the remedy acreage was questioned by the SCS in 1985, based in part on the probable difficulties in revegetating and stabilizing the tilled areas.

CDH-46 "Section 4.0: Historic dosimetric models for RFPu (see FEIS 1980) use Am-241 at 20% of the Pu-239+240 radiometric concentrations. The soil contamination will be there 80 years post any separation, so the maximum transient equilibrium value must be used."

Response: The maximum transient equilibrium value of 5:1 Pu/Am ratio is used in this document.

CDH-47 "Section 4.0, last sentence: The last sentence of the introductory portion of this section (immediately before section 4.1) needs to be re-worded and/or clarified."

Response: This sentence has been reworded.

CDH-48 "Section 4.2, ARARs: The text needs to elaborate on the Memorandum of Understanding and Mutual Cooperation Agreement. How does this agreement relate to this document? What was the purpose of the Agreement?"

Response: The ARAR section has been deleted.

CDH-49 "Section 4.2, ARARs: In this section, there is a sentence referencing airborne levels of plutonium to 0.02 Pcu/$m^3$ (0.0074 Bq/$m^3$). There appears to be a word missing or some sort of error in the test because the sentence is incomplete as written."

Response: The ARAR section has been deleted.

CDH-50 "Section 4.2, Air Monitoring Data: Does the air monitoring data referred to in this section include data that was collected during any phase of remediation, particularly tilling operations?

During the bar-screening portion of remediation, a week-long ambient air concentration close to the activity showed ~0.02 $pCu/m^3$; a value not quite so insignificant as the text implies. However, the average values would still be low, but the text should be changed to clarify this fact."

Response: Air monitoring data has been added to this report.

CDH-51 "Section 4.2, ARARs: Is this section intended to state RFP's proposed ARAR's for IHSS 199? If so, is the Division correct in reading that the proposals are 0.9 pCu/gm (2 dpm/gm) for soil, 0.02 $pCu/m^3$ (0.0074 $Bq/m^3$) for air, and 0.05 pCu/l (0.002 Bq/l) for surface water? What is the source of the proposed ARAR of 0.04 $pCu/m^3$ for Class Y (insoluble) plutonium? Is this value being proposed as a separate ARAR for insoluble plutonium?"

Response: The ARAR section has been deleted.

CDH-52 "Section 4.2, ARARs: Do the ARAR's mentioned in this section have any human and/or public health basis? If so, what is the basis?"

Response: The ARAR section has been deleted.

CDH-53 "Section 4.2, ARARs: Why are ARAR's even addressed in this document? It seems that a more appropriate document for the discussion of ARARs is the RFI/RI Workplan."

Response: The ARAR section has been deleted.

CDH-54 "Section 4.5.2.1: In the middle paragraph on page 35, there is a sentence which refers to a study done by Langer, 1986, concerning impactor samples. This reference, as it presently appears in the text, needs clarification. What is being said here and what does it mean?"

Response: The reference has been clarified.

CDH-55 "Section 4.5.2.1: While there may be three categories in which soil particles can be dislodged from the ground surface, there are more than three specific release mechanisms. Please clarify the text on this item."

Response: The text has been clarified.

CDH-56 "Section 4.5.2.1: Releases from the 903 pad and lip areas were still significant later than the early 1970's. Please see the CDH monitoring data from the RFP southeast perimeter road."

Response: Data reviewed indicates that the remedial action performed on the 903 Pad effectively eliminated continuing emissions from that source.

CDH-57 "Section 4.5.2.2: Ingestion by children is a significant pathway that needs to be considered, especially since large portions of IHSS 199 may one day be open space with unrestricted use."

Response: The soil ingestion pathway has been included within the document for a future use scenario.

CDH-58 "Section 4.5.3: This section, as well as figure 4-1, is incomplete and will be challenged. The descriptors on Figure 4-1 and on page 39 have no basis stated and the factors used are not identified."

Response: The only completed pathway for current use is the inhalation pathway. Future use scenarios do consider the ingestion pathway.

CDH-59 "Section 4.5.3.1: The Division suggests that the recent HP Journal article on worldwide plutonium resuspension be consulted to place the document's values in perspective."

Response: Background levels of plutonium have been included in the source term section.

CDH-60 "Section 4.5.3.1: There was considerable QA/QC done on the soil sampling referenced in the text. However, the text is correct in stating that the (sic) what was done then does not meet today's criteria for QA/QC. It was good work then, just as work done today is good. The future, however, will probably judge today's efforts as inadequate just as we judge yesterday's."

Response: The text has been modified to place the data in proper historical perspective.

CDH-61 "Section 4.5.3.1: The text is pre-judging the air pathway as being the most significant without referencing soil ingestion. This assumption may prove correct but is premature for this document."

Response: The soil ingestion pathway is included for that future use scenario.

CDH-62 "Section 4.5.3.6: Since the Jeffco Open Space land is for recreational use, the use of recreational vehicles should be considered in an evaluation of potential dust reentrainment."

Response: Open Space designation precludes the use of motorized vehicles.

CDH-63 "Section 4.6.2: The EPA lists an F1 factor (GI absorption) of 1E-3, 1E-4, and 1E-5. For plutonium ingested from atmospheric discharges, EPA uses 1E-4 (EPA NESHAPS 1989). For ingestion of plutonium from a water source, EPA and DOE use 1E-3. Without specific documentation as to the form of the material in the specific circumstance, the most conservative value must be used (1E-3)."

Response: Numerous references have been included that state a GI absorption factor of 1E-05 for $^{239}Pu$.

CDH-64 "Section 4.6.3: Bio-uptake from dermal contact and GI absorption is plausible. It may be small but it is plausible."

Response: Numerous references have been included that discount dermal contact as a pathway for biouptake. Soil ingestion and subsequent GI absorption have been considered for the future use scenario.

CDH-65 "Section 4.7: This section has no value in its present form. The narrative descriptors are unsupported with documented values and the qualifications for the selection of the EPA dose/risk factors are not provided. The EPA soil and water ingestion factors are not provided and neither are the EPA inhalation class assumptions stated."

Response: Qualitative descriptions are used appropriately within the limitations of performing a risk assessment prior to collecting any RFI/RI data. EPA soil and water ingestions factors have been added.

CDH-66 "Section 4.7.3: This section indirectly states that the "negligible" risks associated with soil and water ingestion are $8.4 \times 10^{-8}$ and $1.6 \times 10^{-6}$ respectively. However, according to ICRP guidelines, a dose of 100 mrems/yr (the allowable dose for the general public) carries an approximate risk of $5 \times 10^{-5}$. This risk is only 30 times greater than that listed for water ingestion and makes the risk from water ingestion more than "negligible".

Response: Information has been added to address these comments.

CDH-67 "Section 4.7.3: A statement is made in the text which says that "it has been shown that the air pathway from IHSS 199 produces a negligible risk to the public." Where is this shown? Has it been quantified? If it has not been quantified, who's definition of "negligible" is being used?"

Response: Air sampling data has been included that supports the statement in the text.

CDH-68 "Section 4.8: As with section 4.7, there are no criteria presented for the narrative descriptors."

Response: Qualitative descriptions are used appropriately within the limitations of performing a risk assessment prior to collecting any RFI/RI data.

CDH-69 "Section 5.0: Earlier discussion of the remedied lands states that all tilled soil now has a plutonium concentration below the CDH standard of 0.9 pCu/gm. Yet, in the first bullet of this section, the text states that "a few land sections do exceed this limit by a factor of 2-4." Please clarify this apparent contradiction. Once again, a map showing where these areas are that still exceed the CDH standard would be helpful."

Response: The final Past Remedy Report clarifies that tilling has only reduced plutonium concentrations on the 110 acres which have been tilled (see Section 2.2.3.2). Maps showing the tilled acreage are contained in Appendix D, Documents D-10, D-11, D-14, and D-15, and are presented as Figures 2-10 and 2-11.

CDH-70 "Section 5.0: Please expand the discussion of monitoring presented in the fourth bullet of this section. Where are the monitoring stations? What does the data show? Can the data be presented here?"

Response: Environmental monitoring programs at the RFP are addressed in detail in Section 2.1.3 of the final Past Remedy Report. Selected data from the ambient air monitoring program are provided in Appendix D, Documents D-12 and D-17.

CDH-71 "Section 5.0: Can the statement made in the fifth bullet of this section be substantiated? If so, where is the data? Does this statement include measurements made before, during, and after remediation? If it is true, why is it true? Were dust mitigation techniques successfully implemented or was the amount of dust released so small as to have no ill health effects?"

Response: This conclusion has been reworded in the final Past Remedy Report. The conclusion is based on ambient air monitoring results from stations downwind of the IHSS 199 remedy acreage.

CDH-72 "Section 5.0: This section should contain a plan on how the needed data on the meteorology, biology, and air will be collected. It should also identify the interpretive techniques and protocols that will be used on the data to yield the needed results. While the conclusions presented in the Executive Summary may become factually supported in the future, environmental conditions and ecologically significant pathways have not been thoroughly surveyed and reported to date. No data has been presented in this report that, at present, would allow full confirmation or elimination of the various pathways and their relative importance. Section 5.0 is also the logical place for a discussion on the overall effectiveness of the remedy and whether or not it is a suitable remedy to be used on other areas affected by similar plutonium contamination in the soil."

Response: The plan requested in this comment is analogous to the OU 3 FRI/RI Work Plan, which will be prepared in the immediate future per IAG requirements. The overall effectiveness to date of the remedy is discussed in Section 2.2.3.2; the appropriateness of the remedy for use in other plutonium-contaminated areas falls outside of the scope of the Past Remedy Report.